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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/779,565	02/09/2001	Takao Kamoshima	49657-986	6592

7590 05/07/2003

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EXAMINER
LE, THAO X

ART UNIT	PAPER NUMBER
2814	

DATE MAILED: 05/07/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/779,565	KAMOSHIMA ET AL.	
	Examiner	Art Unit	
	Thao X Le	2814	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondenc address* --

P riod for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed *after SIX (6) MONTHS from* the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO *period for reply* is specified above, the *maximum* statutory period will apply and will *expire* SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may *reduce* any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 3-10* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *1 and 3-5* is/are allowed.

6)☒ Claim(s) *6-10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2. Claims 6-7 and 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5523259 to Merchant et al.

Regarding to claim 6, Merchant discloses a semiconductor device comprising a first conductive layer 16.1 formed on a semiconductor substrate and including a polycrystals having a first average grain size, column 4 lines 54-55, a second conductive layer 16.3 formed on a first conductive layer and including a polycrystals having a second average grain size greater than first average grain size, column 4 lines 62-64, and a third conductive layer 16.3 formed on a

second conductive layer and including a polycrystals having a third average grain size, column 5 lines 517-19.

But Merchant does not expressly disclose the third conductive layer having the average grain size smaller than the second average grain size.

However, Merchant discloses the third conductive layer 16.3 having a relative large average grain size depending on the dimension of the plug. Accordingly, it would have been obvious to use teaching of Merchant in the range as claimed, because it has been held that where the general conditions of the claims are discloses in the prior art, it is not inventive to discover the optimum or workable range by routine experimentation. See In re Aller, 220 F.2d 454, 105 USPQ 233, 235 (CCPA 1955).

Regarding to claim 7, Merchant discloses a semiconductor device having a distance between sidewalls of recess becomes small as closer to semiconductor substrate, fig. 5.

But, Merchant reference does not expressly disclose the recess caused by a crystal brain boundary.

However, Merchant discloses the aluminum conductive layer 16.1 having a relative small average grain size, column 4 line 54-55, and aluminum conductive layer 16.2 having relative larger average grain size than 16.1, column 4 line 62-64. Furthermore Merchant discloses the al layers are deposited at different conditions, which result in grain boundary diffusion and recrystallization and grain growth, column 3 line 52-54. At the time of the invention was made; it would have been obvious to one of ordinary skill in the art such recess as claimed would be a consequential structure as disclosed above and in fig 5 by Merchant. Furthermore, where the claimed and the prior

art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a *prima facie* case of either anticipation or obviousness has been established. *In re Best*, 195 USPQ 430, 433 (CCPA 1977).

Regarding to claims 9-10, Merchant discloses the semiconductor device wherein first, second and third conductive layers 16.1, 16.2, 16.3, respectively, includes aluminum, further comprising an insulating layer 20 formed on the semiconductor substrate, and a barrier layer 22 formed on insulating layer, and conducting layer 16.1 being formed on barrier layer, fig. 6.

3. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over US 5523259 to Merchant et al in view of Applicant Admitted Prior Art (APA).

Regarding to claim 8, Merchant does not expressly disclose the semiconductor device further comprising a thin layer formed on conductive layer and third conductive layer and having material different from that conductive or third conductive layer.

But APA discloses the semiconductor device further comprising a thin film TiN layer 109 formed on the conductive layer and having a material different from that of conductive layer, page 1 line 27. At the time the invention was made; it would have been obvious to one of ordinary skill in the art to combine the thin film layer 109 teaching of APA with Merchant, because such thin TiN layer would have provided diffusion barrier layer for the metal interconnection structure.

Allowable Subject Matter

4. Claims 1, 3-5 are allowed because the prior art fails to disclose all the limitation of the base claim including first conductive layer having a substantially planar upper surface and recess is formed directly over the substantially planar upper surface of the first conductive layer.

Response to Arguments

5. Applicant's arguments filed 03/11/03 have been fully considered but they are not persuasive.

Applicant argues that rejection of independent claim is not proper by routine examination. This is not persuasive because Merchant discloses that the maximum grain size is determined by the dimension of the plug, column 5 lines 29-32. Therefore, it is proper to use the teaching of Merchant by routine examination to determine the grain size accordingly. Furthermore, where patentability is said to be based upon particular chosen dimension or upon another variable recited in a claim, the applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Conclusion

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO

MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thao X Le whose telephone number is 703-306-0208. The examiner can normally be reached on M-F from 8:00 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M Fahmy can be reached on 703-308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Thao X. Le
May 2, 2003

PHAT X. CAO
PRIMARY EXAMINER